CLAIMS

1. An apparatus for executing activities assisted by equipment driven by means of rotating or linear hydromotors (27,32;41;48), which hydromotors may be loaded and/or moved in two directions, comprising a pressure source (P) for storing and delivering fluid of high pressure, a high-pressure line and a low-pressure line (T) for transporting fluid to and from at least one hydraulic transformer (HT;40;42;44) provided with a rotor (2) and adjusting means (8;45,47), a hydromotor connected to the hydraulic transformer with connecting lines (28,29;37,38;51) and control means (8;45,47) for controlling the adjustment means and thereby controlling the fluid pressure in the connecting lines, **characterized** in that the control means comprise a sensor (49;57) for measuring directly or indirectly the flow in the connecting lines between the hydromotor and the hydraulic transformer.

2. An apparatus according to claim 1, **characterized** in that the sensor is a flow sensor in one of the connecting lines (28,29;37,38;51).

3. An apparatus according to claim 1, **characterized** in that the sensor is a revolution sensor for measuring the rotor's (2) rate of rotation.

4. An apparatus according to claim 1, **characterized** in that the sensor is a movement sensor for measuring the hydromotor's (27,32;41;48) rate of movement.

5. An apparatus according to any one of claims 1-4, **characterized** in that the sensor forms part of a flow restriction valve in the high-pressure line to the hydraulic transformer and/or in the connecting line.

6. An apparatus according to any one of claims 1-5, **characterized** in that the sensor (49,50;57) is coupled with the adjusting means (45,46,55) for, subject to the flow rate measured, adjusting the pressure in the connecting line (51).

7. An apparatus according to one of the preceding claims wherein the pressure source comprises an aggregate,

characterized in that the control means (47) are adjusted such that the hydromotor uses less power than an adjustable value which is, for example, a portion of the power the aggregate is capable of supplying.

8. An apparatus according to one of the preceding claims, characterized in that the hydraulic transformer (44) is provided with means (45,46,47) to cause the pressure in the connecting line(s) (51) to oscillate around an adjusted valve at a frequency of at least 3 and preferably more than 7 Hertz.

9. An apparatus according to one of the preceding claims wherein the hydraulic transformer has a continuously variable setting controlled by the adjustment means, characterized in that the adjustment means are designed to be able to change the setting within 500 msec from the first extreme setting via the zero position to the second extreme setting.

10. An apparatus according to one of the preceding claims, characterized in that the adjustment means are provided with spring-activated elements for returning the hydraulic transformer into a neutral position wherein the pressure in the connecting line(s) is minimal.

11. An apparatus according to one of the preceding claims wherein the hydromotor is a linear cylinder (41) connected with the hydraulic transformer (42) by means of one connecting line (38), characterized in that the connecting line is provided with means (43) for at underpressure supplying fluid from the low-pressure line.

12. An apparatus according to one of the preceding claims, characterized in that a hydraulic transformer and the connecting line(s) and hydromotor connected thereto are suitable for a pressure exceeding the pressure prevailing in the high-pressure line.

13. A hydraulic transformer for use in an apparatus according to one of the preceding claims, wherein a first fluid flow having a first pressure is transformed into a second fluid flow having a second pressure, comprising a housing (5), a first line connection, a second line connection and a third line connection, a rotor (2) which in

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relation to the housing is limitlessly rotatable, a plurality of fluid chambers (12) whose volume during rotation of the rotor (2) varies between a minimum and a maximum, and a face plate (10) provided with three rotor gates (17,18,18') which during rotation of the rotor (2) serve for sealing and alternatingly connecting via rotor conduits (a), face plate gates (30) and the rotor gates (17,18,18'), the fluid chambers (12) with the three line connections, characterized in that the volume of the fluid chambers (12) to be sealed by means of the face plate (10) is maximally four times as large as the minimum.

14. A hydraulic transformer according to claim 13, characterized in that the volume of the fluid chambers (12) to be sealed by means of the face plate (10) is maximally three times as large as the minimum.

15. A hydraulic transformer according to claim 13 or 14, characterized in that the rotor has nine or twelve fluid chambers.

16. A hydraulic transformer according to claim 13, 14 or 15, characterized in that the face plate gates (30) and the rotor gates (17,18,18') are dimensioned such that at least two rotor gates are of the same size, and all three walls (23) between the rotor gates simultaneously seal off a face plate gate (30).

17. A hydraulic transformer for use in an apparatus according to one of the claims 1-12 wherein a first fluid flow having a first pressure is transformed into a second fluid flow having a second pressure, comprising a housing (5), a first line connection, a second line connection and a third line connection, a rotor (2) which in relation to the housing is limitlessly rotatable, a plurality of fluid chambers (12) whose volume, when the rotor (2) rotates at a first angle, varies between a minimum and a maximum, and a face plate (10) provided with face plate conduits (b) for, while the rotor (2) is rotating, alternatingly connecting the fluid chambers (12) with the three line connections, which face plate (10) is rotatable in relation to the housing (5) and is provided with means for without interruption keeping a face plate conduit (b) in communi-

cation with the respective line connection while the face plate (10) is rotating, **characterized** in that the face plate (10), in relation to the housing (5), is able to rotate at a second angle which is similar to the first angle.

18. A hydraulic transformer according to one of the claims 13-17, wherein the face plate (10) at the side of the fluid chambers (12) is bordered by a first separating surface (V1) and at the side facing away from the fluid chambers by a second separating surface (V2), the first separating surface comprising at least three rotor gates (17,18,18') located at a first radius and being in communication with three face plate conduits (b), and the second separating surface (V2) comprising two housing gates (20,20') located at a second radius, and each being in communication with a face plate conduit (b), **characterized** in that the third face plate conduit is in communication with a housing gate located at a third radius which is different from the second radius.

19. A hydraulic transformer according to one of the claims 13-18, wherein the third face plate conduit is in communication with a housing gate at the external circumference of the face plate.

20. A hydraulic transformer according to one of the claims 13-19, wherein the third face plate conduit is in communication with a housing gate (21) near the rotation axis (11) of the face plate (10).

21. A hydraulic transformer according to one of the claims 13-20, **characterized** in that at the second separating surface (V2), the housing (5) is provided among other things with four face plate gates (24) located at the second radius; two face plate gates (24a, 24c) being positioned diametrically opposite one another and being in direct communication with the first (B) and the second (T) line connection respectively, while the other two face plate gates (24b, 24d) positioned diametrically opposite one another are in communication via a shuttle valve (26) with the first (B) and second line connection (T).

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22. A hydraulic transformer according to claim 21, characterized in that the shuttle valve (26) forms part of the face plate (10) or is coupled thereto.

CLAIMS

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1. An apparatus for executing activities assisted by equipment driven by means of rotating or linear hydromotors (27,32; 41; 48), which motors may be loaded and/or moved in two directions, comprising a pressure source (P) for storing and delivering highly compressed fluid of high pressure, a high-pressure line for transporting fluid from the pressure source to at least one hydraulic transformer (HT; 40; 42; 44) provided with a rotor (2) and provided with adjusting means (8; 45,47) for controlling the hydromotor through the adjustment of the fluid pressure in a connecting line (28,29; 37,38; 51) between the hydraulic transformer and a hydromotor connected therewith and a low-pressure line (T) connected with the hydraulic transformer for discharging low-pressure fluid **characterized** in that control means (46,47,49,50; 55,57) are provided for restricting a fluid flow in the hydraulic transformer.

2. An apparatus according to claim 1, **characterized** in that the control means comprise at least one sensor (49,50; 57) for directly or indirectly measuring the flow rate of the fluid flow in the hydraulic transformer, such as a flow sensor in the high-pressure line to the hydraulic transformer, a flow sensor in a connecting line, a revolution sensor for measuring the rotor's rate of rotation, or a movement sensor for measuring the hydromotor's rate of movement.

3. An apparatus according to claim 2, **characterized** in that the sensor forms part of a flow restriction valve in the high-pressure line to the hydraulic transformer and/or in the connecting line.

4. An apparatus according to claim 2 or 3 **characterized** in that the sensor (49,50; 57) is coupled with the adjusting means (45,46,55) for, subject to the flow rate measured, adjusting the pressure in the connecting line (51).

5. An apparatus according to one of the preceding claims wherein the pressure source comprises an aggregate

characterized in that the control means (47) are adjusted such that the hydromotor uses less power than an adjustable value which is, for example, a portion of the power the aggregate is capable of supplying.

6. An apparatus according to one of the preceding claims characterized in that the hydraulic transformer (44) is provided with means (45,46,47) to cause the pressure in the connecting line(s) (51) to oscillate around an adjusted valve at a frequency of at least 3 and preferably more than 7 Hertz.

7. An apparatus according to one of the preceding claims wherein the hydraulic transformer has a continuously variable setting controlled by the adjustment means, characterized in that the adjustment means are designed to be able to change the setting within 500 msec from the first extreme setting via the zero position to the second extreme setting.

8. An apparatus according to one of the preceding claims characterized in that the adjustment means are provided with spring-activated elements for returning the hydraulic transformer into a neutral position wherein the pressure in the connecting line(s) is minimal.

9. An apparatus according to one of the preceding claims wherein the hydromotor is a linear cylinder (41) connected with the hydraulic transformer (42) by means of one connecting line (38), characterized in that the connecting line is provided with means (43) for at underpressure supplying fluid from the low-pressure line.

10. An apparatus according to one of the preceding claims, characterized in that a hydraulic transformer and the connecting line(s) and hydromotor connected thereto are suitable for a pressure exceeding the pressure prevailing in the high-pressure line.

11. A hydraulic transformer for use in an apparatus according to one of the preceding claims, wherein a first fluid flow having a first pressure is transformed into a second fluid flow having a second pressure, comprising a housing (5), a first line connection, a second line connection and a third line connection, a rotor (2) which in

relation to the housing is limitlessly rotatable, a plurality of fluid chambers (12) whose volume during rotation of the rotor (2) varies between a minimum and a maximum, and a face plate (10) provided with three rotor gates (17,18, 18') which during rotation of the rotor (2) serve for sealing and alternatingly connecting via rotor conduits (a), face plate gates (30) and the rotor gates (17,18,18'), the fluid chambers (12) with the three line connections, **characterized** in that the volume of the fluid chambers (12) to be sealed by means of the face plate (10) is maximally four times as large as the minimum.

12. A hydraulic transformer according to claim 11, **characterized** in that the volume of the fluid chambers (12) to be sealed by means of the face plate (10) is maximally three times as large as the minimum.

13. A hydraulic transformer according to claim 11 or 12, **characterized** in that the rotor has nine or twelve fluid chambers.

14. A hydraulic transformer according to claim 11, 12 or 13, **characterized** in that the face plate gates (30) and the rotor gates (17,18,18') are dimensioned such that at least two rotor gates are of the same size, and all three walls (23) between the rotor gates simultaneously seal off a face plate gate (30).

15. A hydraulic transformer for use in an apparatus according to one of the claims 1-10 wherein a first fluid flow having a first pressure is transformed into a second fluid flow having a second pressure, comprising a housing (5), a first line connection, a second line connection and a third line connection, a rotor (2) which in relation to the housing is limitlessly rotatable, a plurality of fluid chambers (12) whose volume, when the rotor (2) rotates at a first angle, varies between a minimum and a maximum, and a face plate (10) provided with face plate conduits (b) for, while the rotor (2) is rotating, alternatingly connecting the fluid chambers (12) with the three line connections, which face plate (10) is rotatable in relation to the housing (5) and is provided with means for without interruption keeping a face plate conduit (b) in communi-

cation with the respective line connection while the face plate (10) is rotating, **characterized** in that the face plate (10), in relation to the housing (5), is able to rotate at a second angle which is similar to the first angle.

16. A hydraulic transformer according to one of the claims 11-15, wherein the face plate (10) at the side of the fluid chambers (12) is bordered by a first separating surface (V1) and at the side facing away from the fluid chambers by a second separating surface (V2), the first separating surface comprising at least three rotor gates (17,18,18') located at a first radius and being in communication with three face plate conduits (b), and the second separating surface (V2) comprising two housing gates (20,20') located at a second radius, and each being in communication with a face plate conduit (b), **characterized** in that the third face plate conduit is in communication with a housing gate located at a third radius which is different from the second radius.

17. A hydraulic transformer according to one of the claims 11-16, wherein the third face plate conduit is in communication with a housing gate at the external circumference of the face plate.

18. A hydraulic transformer according to one of the claims 11-17, wherein the third face plate conduit is in communication with a housing gate (21) near the rotation axis (11) of the face plate (10).

19. A hydraulic transformer according to one of the claims 11-18, **characterized** in that at the second separating surface (V2), the housing (5) is provided among other things with four face plate gates (24) located at the second radius; two face plate gates (24a, 24c) being positioned diametrically opposite one another and being in direct communication with the first (B) and the second (T) line connection respectively, while the other two face plate gates (24b, 24d) positioned diametrically opposite one another are in communication via a shuttle valve (26) with the first (B) and second line connection (T).

20. A hydraulic transformer according to claim 19, characterized in that the shuttle valve (26) forms part of the face plate (10) or is coupled thereto.

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